WE CLAIM:

1. A process for preparing a composite medium suitable for use in facilitating substantial removal of at least one constituent from a fluid stream, the process comprising the acts of:

dissolving a polymer in a solvent so as to produce a matrix solution;

mixing at least one organic active component with said matrix solution so as to produce a composite medium solution;

dividing at least a portion of said composite medium solution into a plurality of discrete portions; and

substantially neutralizing said solvent in said plurality of discrete portions of said composite medium solution so that said plurality of discrete portions at least partially solidify.

2. The process as recited in claim 1, wherein said act of substantially neutralizing said solvent comprises the act of diluting said solvent.

3. The process as recited in claim 1, wherein said polymer is dissolved in said solvent at room temperature and standard pressure.

4. The process as recited in claim 1, wherein said at least one active component is mixed with said matrix solution at room temperature and standard pressure.

5. The process as recited in claim 1, further comprising the act of sorting said plurality of discrete portions so as to obtain a desired size fraction.

6. The process as recited in claim 1, further comprising the act of adding at least one inorganic active component to said matrix solution, so as to form said composite medium solution.

7. The process as recited in claim 6, wherein said at least one inorganic active component is selected from the group consisting of: crystalline silicotitanate and ammonium molybdophosphate.

8. The process as recited in claim 6, wherein said at least one inorganic active component is selected from the group comprising: ion exchangers, extractants, and complexants.

9. The process as recited in claim 1, wherein said act of dividing said at least a portion of said composite medium solution into a plurality of discrete portions comprises the acts of:

dispensing composite medium solution from one end of a fluid conduit so as to produce a plurality of drops; and

directing a flow of gas proximate to said one end of said fluid conduit, said flow of gas facilitating detachment of said plurality of drops from said one end of said fluid conduit.

10. The process as recited in claim 1, further comprising the act of reconstituting said solvent.

11. The process as recited in claim 1, wherein said polymer substantially comprises polyacrylonitrile.

12. The process as recited in claim 1, wherein said at least one organic active component is selected from the group consisting of: carbon and carbamoyl phosphine oxides.

13. The process as recited in claim 12, wherein said at least one organic active component comprises octyl (phenyl) N,N-diisobutylcarbamoylmethylphosphineoxide

14. The process as recited in claim 1, further comprising the act of drying said plurality of discrete portions.

15. The process as recited in claim 14, wherein said act of drying said plurality of beads comprises the act of exposing said plurality of discrete portions to air.

16. The process as recited in claim 1, wherein said solvent is selected from the group consisting of: aprotic organic solvents, nitric acid, sulfuric acid, and aqueous solutions of organic salts.

17. The process as recited in claim 1, wherein said at least one organic active component is selected from the group consisting of: ion exchangers, extractants, and complexants.

18. The process as recited in claim 1, further comprising the act of adjusting a weight of active component as a percentage of a total weight of the composite medium within a range of about five percent to about ninety five percent.

19. A composite medium, the composite medium being prepared by a process comprising the acts of:

dissolving a polymer in a solvent so as to produce a matrix solution;

mixing at least one organic active component with said matrix solution so as to produce a composite medium solution;

diluting said solvent in said composite medium solution; and

drying said at least a portion of said composite medium solution from which said solvent has been substantially removed.

20. The composite medium as recited in claim 19, wherein said at least one organic active component is selected from the group consisting of: ion exchangers, extractants, and complexants.

21. The composite medium as recited in claim 19, wherein said solvent is selected from the group consisting of: aprotic organic solvents, nitric acid, sulfuric acid, and aqueous solutions of organic salts.

22. The composite medium as recited in claim 19, wherein said polymer is organic.

23. The composite medium as recited in claim 22, wherein said polymer substantially comprises polyacrylonitrile.

24. The composite medium as recited in claim 19, wherein the process by which the composite medium is formed further comprises the act of mixing at least one additional active component with said at least one organic active component and said dissolved polymer, so as to form said composite medium solution.

25. The composite medium as recited in claim 24, wherein said at least one additional active component is selected from the group consisting of: ion exchangers, extractants, and complexants.

26. The composite medium as recited in claim 24, wherein said at least one additional active component is inorganic.

27. The composite medium as recited in claim 26, wherein said at least one inorganic active component is selected from the group consisting of: crystalline silicotitanate and ammonium molybdophosphate.

28. The composite medium as recited in claim 19, wherein said at least one organic active component is selected from the group consisting of: carbon and carbamoyl phosphine oxides.

29. The composite medium as recited in claim 28, wherein said at least one organic active component comprises octyl (phenyl) N,N-diisobutylcarbamoylmethylphosphine oxide.

30. A composite medium suitable for use in processing a fluid stream, the composite medium comprising:

a porous matrix substantially comprising a polymer; and

at least one active component supported by said porous matrix, said at least one active component being selected from the group consisting of: carbon, crystalline silicotitanate, and carbamoyl phosphine oxides.

31. The composite medium as recited in claim 30, wherein said at least one active component comprises octyl (phenyl) N,N-diisobutylcarbamoylmethylphosphine oxide.

32. The composite medium as recited in claim 30, wherein the composite medium is formed as a plurality of beads.

33. The composite medium as recited in claim 32, wherein each of said plurality of beads is substantially spherical.

34. The composite medium as recited in claim 30, wherein said polymer is organic.

35. The composite medium as recited in claim 30, wherein said polymer substantially comprises polyacrylonitrile.

36. A composite medium, comprising:

a porous matrix substantially comprising polyacrylonitrile; and

at least one active component supported by said porous matrix, said at least one active component being selected from the group consisting of: crystalline silicotitanate, carbon, and octyl (phenyl) N,N-diisobutylcarbamoylmethylphosphine oxide.

37. The composite medium as recited in claim 36, further comprising at least one active component selected from the group consisting of: ion exchangers, extractants, and complexants.

38. A column assembly for facilitating substantial removal of at least one constituent of a fluid stream passing through the column assembly, the column assembly comprising:

a column housing defining a chamber and having a column housing inlet and outlet connections in fluid communication with said chamber; and

a composite medium disposed in said chamber, wherein said composite medium comprises a plurality of discrete portions and each of said plurality of discrete portions comprises:

a porous matrix material substantially comprising a polymer; and

at least one active component supported by said porous matrix material, said at least one active component being selected from the group consisting of: crystalline silicotitanate, carbon, and carbamoyl phosphine oxides.

39. The column assembly as recited in claim 38, wherein the at least one active component comprises octyl (phenyl) N,N-diisobutylcarbamoylmethylphosphine oxide.

40. The column assembly as recited in claim 38, wherein said porous matrix material substantially comprises polyacrylonitrile.

41. The column assembly as recited in claim 38, further comprising at least one active component selected from the group consisting of: ion exchangers, extractants, and complexants.

42. An ion processing system suitable for facilitating removal of at least one constituent of a fluid stream passing through the ion processing system, the ion processing system comprising:

a column assembly including:

a column housing defining a chamber and having column housing inlet and outlet connections in fluid communication with said chamber; and

a composite medium disposed in said chamber, wherein said composite medium comprises a plurality of discrete portions and each of said plurality of discrete portions comprises:

a porous matrix material substantially comprising polyacrylonitrile; and

at least one organic active component supported by said porous matrix material, said at least one organic active component being selected from the group consisting of: crystalline silicotitanate, carbon, and carbamoyl phosphine oxides; and

column inlet and column outlet piping in fluid communication with said column assembly.

43. The ion processing system as recited in claim 42, wherein said at least one organic active component comprises octyl (phenyl) N,N-diisobutylcarbamoylmethylphosphine oxide.

44. The ion processing system as recited in claim 42, further comprising at least one inorganic active component.

45. The ion processing system as recited in claim 44, wherein said at least one inorganic active component substantially comprises crystalline silicotitanate.

46. The ion processing system as recited in claim 44, wherein said at least one inorganic active component is selected from the group consisting of: ion exchangers, complexants, and extractants.

47. The ion processing system as recited in claim 42, further comprising at least one active component selected from the group consisting of: ion exchangers, complexants, and extractants.

48. The ion processing system as recited in claim 42, further comprising at least one mechanical filter in fluid communication with the fluid stream.